

TEST REPORT

For RF

Report No.: **CHTEW22120060** **Report verification:** 
Project No.: **SHT2208214102EW**
FCC ID: **SS4SF650**
Applicant's name: **BLUEBIRD INC.**
Address: 3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea
Product Name: **Smart Full Touch Handheld Computer**
Trade Mark: BLUEBIRD
Model No.: SF650
Listed Model(s): -
Standard: **FCC CFR Title 47 Part 15 Subpart C Section 15.225**
Date of receipt of test sample: Nov.15, 2022
Date of testing: Nov.16, 2022-Dec.07, 2022
Date of issue: Dec.08, 2022
Result: **PASS**

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Hans Hu

Testing Laboratory Name: **Shenzhen Huatongwei International Inspection Co., Ltd.**

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road,
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The test report merely correspond to the test sample.

Contents

<u>1.</u>	<u>TEST STANDARDS AND REPORT VERSION</u>	<u>3</u>
1.1.	Test Standards	3
1.2.	Report version information	3
<u>2.</u>	<u>TEST DESCRIPTION</u>	<u>4</u>
<u>3.</u>	<u>SUMMARY</u>	<u>5</u>
3.1.	Client Information	5
3.2.	Product Description	5
3.3.	Radio Specification Description	6
3.4.	Testing Laboratory Information	6
<u>4.</u>	<u>TEST CONFIGURATION</u>	<u>7</u>
4.1.	Test mode	7
4.2.	Test sample information	7
4.3.	Support unit used in test configuration and system	7
4.4.	Testing environmental condition	7
4.5.	Statement of the measurement uncertainty	8
4.6.	Equipments Used during the Test	9
<u>5.</u>	<u>TEST CONDITIONS AND RESULTS</u>	<u>11</u>
5.1.	Antenna requirement	11
5.2.	AC Power Conducted Emissions	12
5.3.	Field Strength of the Fundamental and Mask Measurement	14
5.4.	20dB Bandwidth	16
5.5.	Radiated Spurious Emission	18
5.6.	Frequency Stability	22
<u>6.</u>	<u>TEST SETUP PHOTOS</u>	<u>24</u>
<u>7.</u>	<u>EXTERNAL AND INTERNAL PHOTOS OF THE EUT</u>	<u>25</u>

1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

[FCC Rules Part 15.225](#): Operation within the band 13.110-14.010 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2022-12-08	Original

2. TEST DESCRIPTION

Report clause	Test Items	Standard Requirement	Result	Test Engineer
5.1	Antenna requirement	15.203	PASS	Xiaoqin Li
5.2	AC Power Conducted Emissions	15.207	PASS	Dongyang Wu
5.3	Field Strength of the Fundamental and Mask Measurement	15.225(a)(b)(c)	PASS	Quanhai Deng
5.4	20dB Bandwidth	15.215	PASS	Xiaoqin Li
5.5	Radiated Spurious Emission	15.225(d)&15.209	PASS	Chuanfeng Li
5.6	Frequency Stability	15.225(e)	PASS	Xiaoqin Li

Note: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	BLUEBIRD INC.
Address:	3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea
Manufacturer:	BLUEBIRD INC.
Address:	3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea
Factory1:	Bluebird Inc.
Address:	SSang-young IT Twin tower-B 7~8F), 531, Dunchon-daero, Jungwon-gu, Seongnam-si, Gyeonggi-do, Korea
Factory2:	TOP INTERCUBE ELECTRONICS VINA CO., LTD
Address:	Lo C1,Ba thien II Industrial park, Thien Ke Ward, Binh Xuyen District,Vinh Phuc Province, Vietnam

3.2. Product Description

Main unit information:	
Product Name:	Smart Full Touch Handheld Computer
Trade Mark:	BLUEBIRD
Model No.:	SF650
Listed Model(s):	-
Power supply:	DC 3.85V from Battery
Hardware version:	V01
Software version:	SF650-AND12-EN-20221119_R1.00-user
Accessory unit information:	
Battery information:	Model: BAT-500001 Type: LI-ION POLYMER BATTERY Rated/Min: 4850mAh, 18.67Wh Typical Capacity: 5000mAh, 19.25Wh Limited Charge Voltage: 4.4V Nominal Voltage: 3.85V
Adapter information:	Model: KSA29B0500200D5 Input: 100-240Va.c., 50/60Hz 0.5A Output: 5.0Vd.c., 2.0A 10.0W

3.3. Radio Specification Description

Modulation:	ASK
Operation frequency:	13.56MHz
Channel number:	1
Antenna type:	LOOP
Antenna gain:	0 dBi

3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Connect information:	Phone: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn	
Qualifications	Type	Accreditation Number
	FCC	762235

4. TEST CONFIGURATION

4.1. Test mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
The engineering test program was provided and enabled to make EUT continuous transmit.
For Radiated spurious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data Recorded in the report.

4.2. Test sample information

Test item	HTW sample no.
RF Radiated test items	YPHT22082141010
EMI test items	YPHT22082141011

Note:

RF Radiated test items: Field Strength of the Fundamental and Mask Measurement, 20dB Bandwidth, Radiated Spurious Emission, Frequency Stability

EMI test items : AC Power Conducted Emissions

4.3. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Whether support unit is used?			
✓ No			
Item	Equipement	Trade Name	Model No.
1			
2			

4.4. Testing environmental condition

Type	Requirement	Actual
Temperature:	15~35°C	25°C
Relative Humidity:	25~75%	50%
Air Pressure:	860~1060mbar	1000mbar

4.5. Statement of the measurement uncertainty

Test Items	Measurement Uncertainty
AC Power Conducted Emissions	3.21 dB
Radiated emissions below 1GHz	4.54dB
Radiated emissions above 1GHz	5.10 dB
Occupied Bandwidth	0.002%

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

4.6. Equipments Used during the Test

● Conducted Emission							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	HTWE0114	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	HTWE0111	ESCI	101247	2022/08/30	2023/08/29
●	Artificial Mains	SCHWARZBECK	HTWE0113	NNLK 8121	573	2022/08/29	2023/08/28
●	Pulse Limiter	R&S	HTWE0193	ESH3-Z2	101447	2022/08/29	2023/08/28
●	RF Connection Cable	HUBER+SUHNER	HTWE0113-02	ENVIROFLEX 142	EF-NM-BNCM-2M	2022/09/17	2023/09/16
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-6th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0127	SAC-3m-02	C11121	2018/09/30	2023/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2022/08/30	2023/08/29
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2021/04/06	2024/04/05
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2021/04/06	2024/04/05
●	Pre-Amplifier	SCHWARZBECK	HTWE0295	BBV 9742	N/A	2022/11/04	2023/11/03
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-01	N/A	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-02	SUCOFLEX104	501184/4	2022/02/25	2023/02/24
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-7th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	C11121	2018/09/27	2023/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2022/08/25	2023/08/24
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2020/04/27	2023/04/26
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2022/11/04	2023/11/03
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0119-05	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	HTWE0242	FSV40	100048	2022/08/25	2023/08/24
●	Signal & Spectrum Analyzer	R&S	HTWE0262	FSW26	103440	2022/08/25	2023/08/24
●	Spectrum Analyzer	Agilent	HTWE0286	N9020A	MY50510187	2022/08/25	2023/08/24
●	Radio communication tester	R&S	HTWE0287	CMW500	137688-Lv	2022/08/25	2023/08/24
●	Test software	Tonscend	N/A	JS1120	N/A	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

TEST RESULT

☒ **Passed** ☐ **Not Applicable**

The antenna type is a LOOP antenna, please refer to the below antenna photo.



5.2. AC Power Conducted Emissions

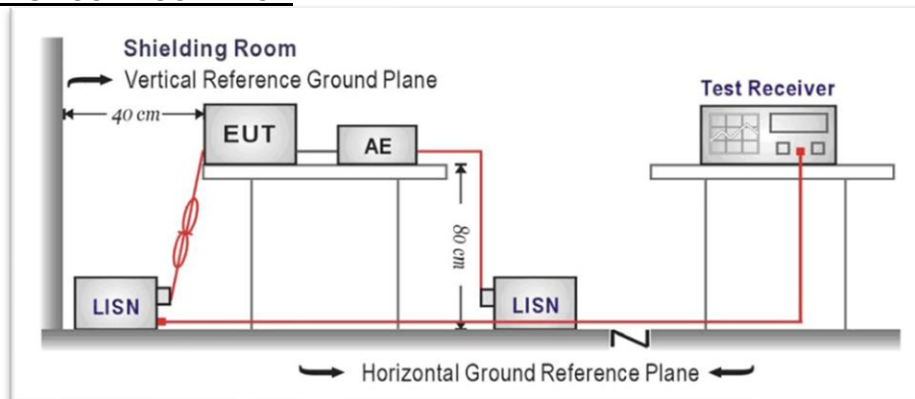
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10
2. The EUT was placed on a plat form of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50ohm / 50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE:

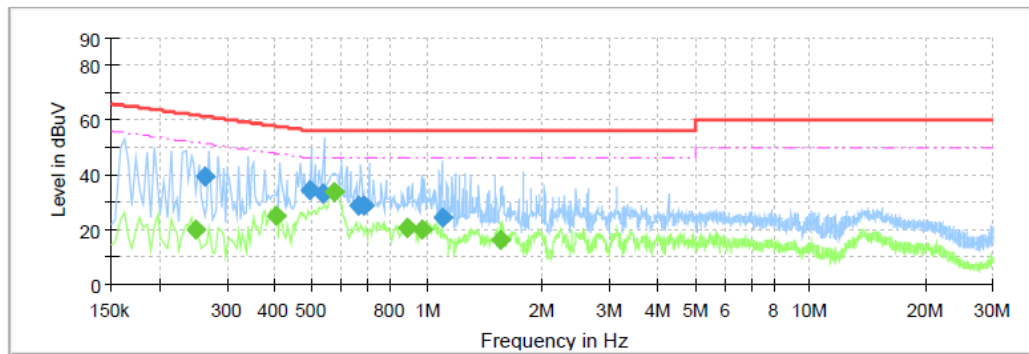
Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Test Line:

L

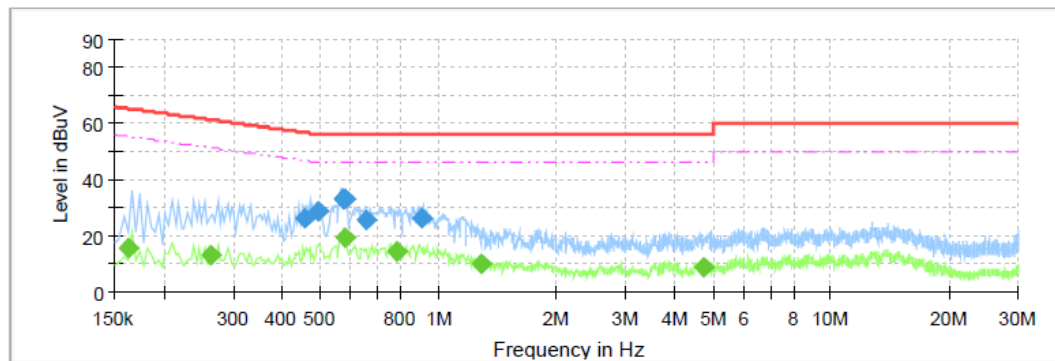


Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.247500	---	20.06	51.84	31.78	L1	10.0
0.263500	39.33	---	61.32	21.99	L1	10.0
0.403500	---	25.28	47.78	22.50	L1	10.0
0.491500	34.15	---	56.14	22.00	L1	10.0
0.535500	33.40	---	56.00	22.60	L1	10.0
0.571500	---	33.56	46.00	12.44	L1	10.0
0.663500	28.97	---	56.00	27.03	L1	10.0
0.683500	28.66	---	56.00	27.34	L1	10.0
0.891500	---	20.74	46.00	25.26	L1	10.0
0.971500	---	19.97	46.00	26.03	L1	10.0
1.099500	24.51	---	56.00	31.49	L1	10.0
1.551500	---	16.08	46.00	29.92	L1	10.0

Test Line:

N



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.162000	---	15.77	55.36	39.59	N	10.0
0.263500	---	13.32	51.32	38.00	N	10.0
0.455500	26.39	---	56.77	30.38	N	10.0
0.491500	28.65	---	56.14	27.49	N	10.0
0.572500	32.99	---	56.00	23.01	N	10.0
0.575500	33.10	---	56.00	22.90	N	10.0
0.575500	---	19.31	46.00	26.69	N	10.0
0.651500	25.63	---	56.00	30.37	N	10.0
0.779500	---	14.52	46.00	31.48	N	10.0
0.911500	26.28	---	56.00	29.72	N	10.0
1.279500	---	9.91	46.00	36.09	N	10.0
4.767500	---	8.69	46.00	37.31	N	10.0

5.3. Field Strength of the Fundamental and Mask Measurement

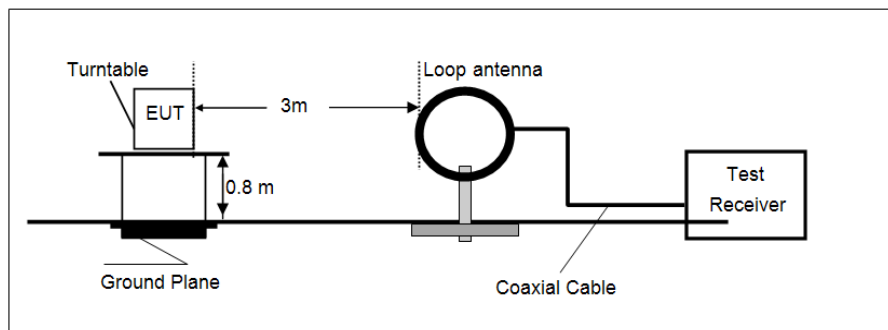
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.225(a)(b)(c)

Fundamental frequency(MHz)	Field strength of fundamental (uV/m @30m)	Field strength of fundamental (dBuV/m @3m)
13.553-13.567	15848	124.0
13.410-13.553&13.567-13.710	334	90.5
13.110-13.410&13.710-14.010	106	80.5

Note: Limit dBuV/m @3m =Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10 on radiated measurement.

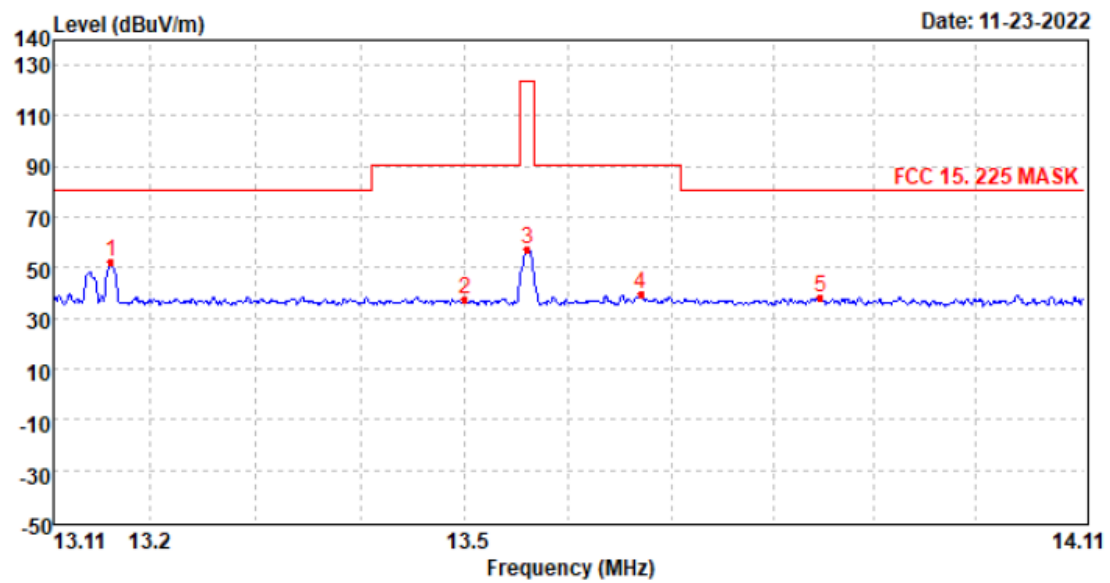
TEST MODE:

Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Field Strength of The Fundamental and Mask



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	13.16	25.22	20.21	6.68	0.00	52.11	80.50	-28.39	Peak
2	13.50	11.18	20.07	6.66	0.00	37.91	90.50	-52.59	Peak
3	13.56	30.80	20.05	6.65	0.00	57.50	124.00	-66.50	Peak
4	13.67	12.94	20.00	6.65	0.00	39.59	90.50	-50.91	Peak
5	13.85	11.91	19.93	6.64	0.00	38.48	80.50	-42.02	Peak

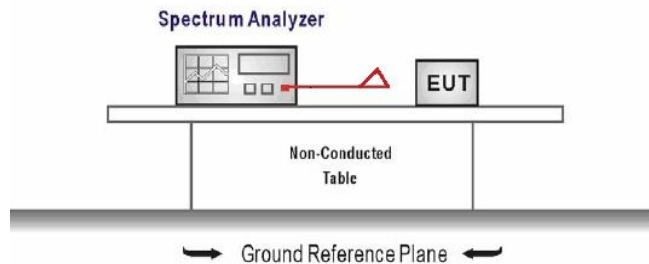
5.4. 20dB Bandwidth

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.215

Intentional radiators must be designed to ensure that the 20dB emission bandwidth in the specific band 13.553~13.567MHz.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW $\geq$ 1% of the 20 dB bandwidth, VBW $\geq$ RBW
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

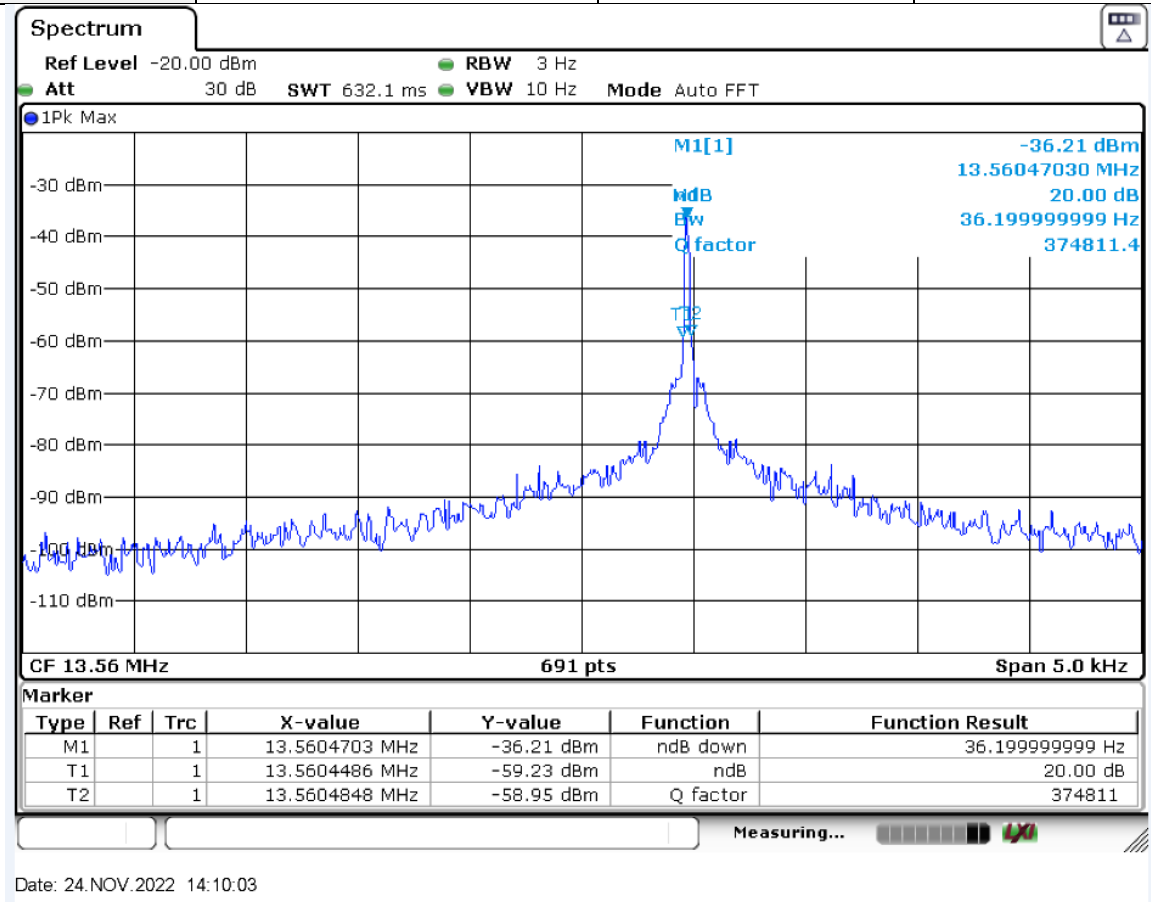
TEST MODE:

Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Frequency	Measurement data (MHz)	Limit (MHz)	Result
f _L	13.5604486	>13.553	PASS
f _H	13.5604848	<13.567	PASS



5.5. Radiated Spurious Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209&15.225(d)

Limit for frequency below 30MHz:

Frequency	Limit (uV/m)	Measurement Distance(m)	Remark
0.009~0.490	2400/F(kHz)	300	Quasi-peak
0.490~1.705	24000/F(kHz)	30	Quasi-peak
1.705~30.0	30	30	Quasi-peak

Note: Limit dBuV/m @3m = Limit dBuV/m @300m + 40*log(300/3)= Limit dBuV/m @300m +80,

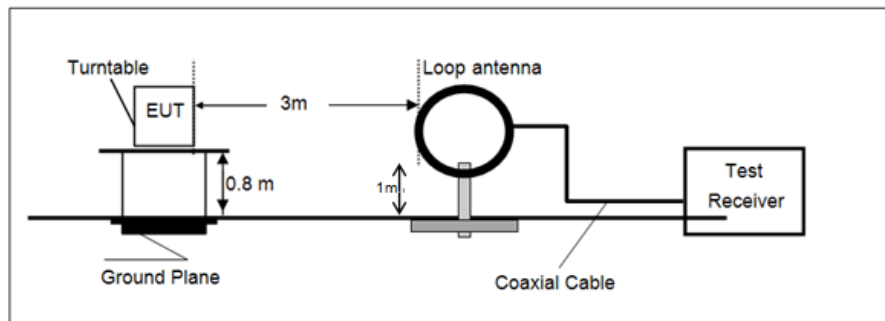
Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

Limit for frequency above 30MHz:

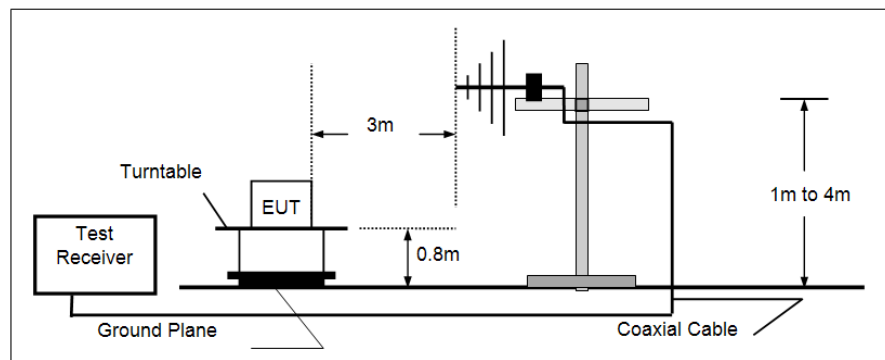
Frequency	Limit (dBuV/m@3m)	Remark
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

- 9 kHz ~ 30 MHz



- 30 MHz ~ 1 GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 30MHz:
RBW=10 kHz, VBW=30 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
 - (3) 30MHz to 1 GHz:
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

TEST MODE:

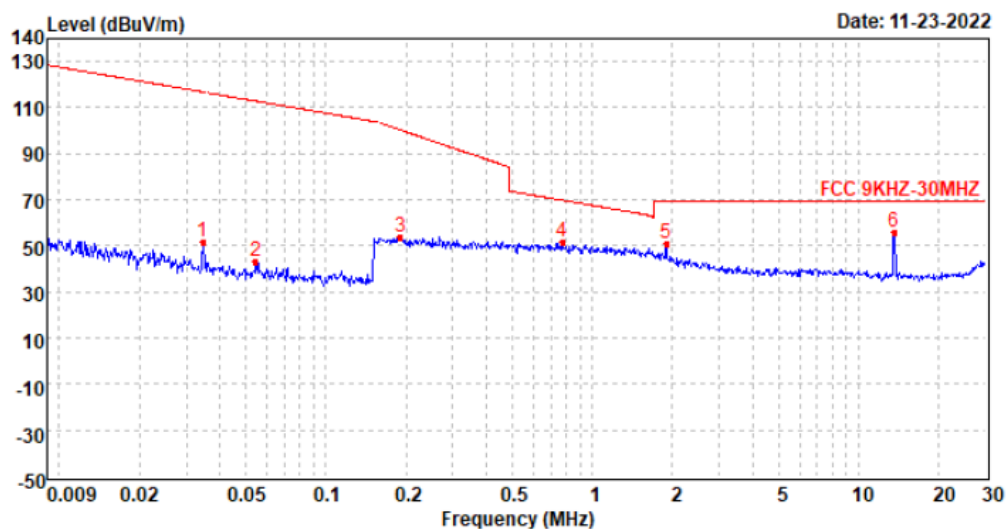
Please refer to the clause 4.1

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Test frequency range:

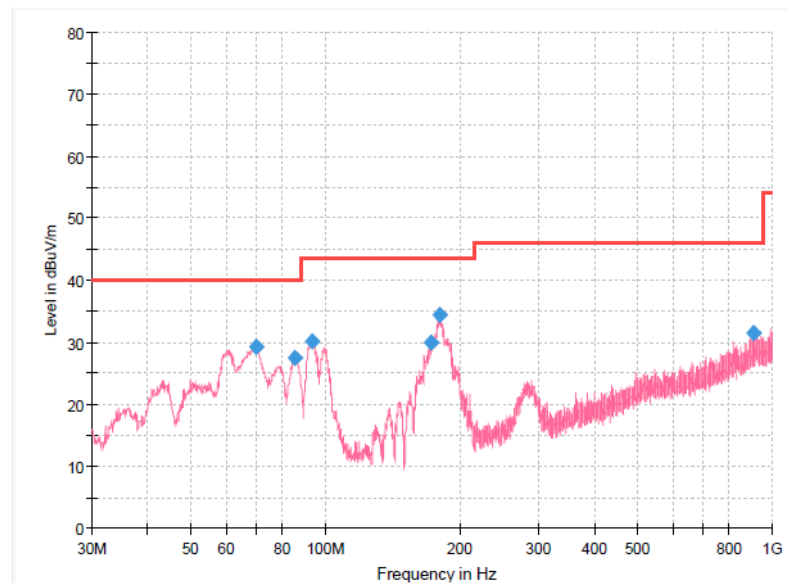
Below 30MHz



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	0.03	21.98	22.34	7.21	0.00	51.53	116.82	-65.29	Peak
2	0.05	13.79	22.30	7.21	0.00	43.30	112.88	-69.58	Peak
3	0.19	24.41	22.21	7.21	0.00	53.83	100.46	-46.63	Peak
4	0.78	22.07	22.20	7.20	0.00	51.47	69.81	-18.34	Peak
5	1.90	21.64	22.20	7.19	0.00	51.03	69.54	-18.51	Peak
6	13.62	29.08	20.02	6.65	0.00	55.75	69.54	-13.79	Peak

Test frequency range: 30MHz~1000MHz

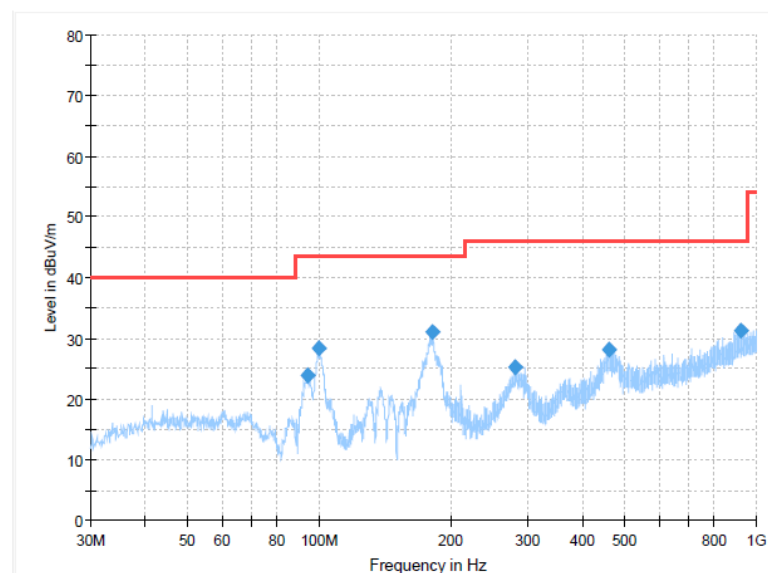
Polarization: Vertical



Final Result

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
70.133750	29.38	40.00	10.62	100.0	V	179.0	-13.2
85.896250	27.42	40.00	12.58	100.0	V	168.0	-13.9
93.292500	30.24	43.50	13.26	100.0	V	91.0	-12.3
173.075000	29.85	43.50	13.65	100.0	V	91.0	-13.0
180.713750	34.44	43.50	9.06	100.0	V	102.0	-12.4
909.668750	31.46	46.00	14.54	100.0	V	249.0	6.4

Polarization: Horizontal



Final Result

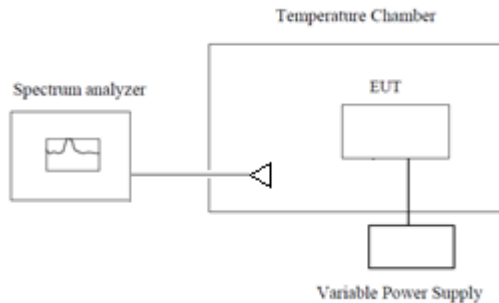
Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
94.020000	23.98	43.50	19.52	300.0	H	151.0	-12.2
99.718750	28.29	43.50	15.21	300.0	H	298.0	-10.8
181.562500	31.07	43.50	12.43	100.0	H	262.0	-12.3
280.502500	25.35	46.00	20.65	100.0	H	240.0	-8.2
461.165000	28.26	46.00	17.74	100.0	H	22.0	-3.1
924.582500	31.24	46.00	14.76	100.0	H	62.0	6.6

5.6. Frequency Stability

LIMIT

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment under test was connected to an external power supply.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -20°C . After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of $+50^{\circ}\text{C}$ reached.

TEST MODE:

Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Test Enviroment		Frequency Reading(MHz)	Frequency Error(%)	Limit	Result
Voltage	Temperature(°C)				
DC 3.85V	-20	13.56000	0.0000	±0.01%	Pass
	-10	13.56005	0.0004	±0.01%	Pass
	0	13.56010	0.0007	±0.01%	Pass
	10	13.56002	0.0001	±0.01%	Pass
	20	13.56004	0.0003	±0.01%	Pass
	30	13.56009	0.0007	±0.01%	Pass
	40	13.56007	0.0005	±0.01%	Pass
	50	13.56003	0.0002	±0.01%	Pass

6. TEST SETUP PHOTOS

Conducted Emissions (AC Mains)



Radiated Emissions



7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Refer to the test report No.: CHTEW22120050

-----End of Report-----